

## INVESTIGATION OF TiO<sub>2</sub> THIN FILMS STABILIZED IN RUTILE AND ANATASE PHASES

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There has been a great interest in preparing both rutile and anatase TiO<sub>2</sub> films for optical, electrical and photocatalysis applications. The rutile structure is superior in optical properties (a high refractive index of 2.7 at a wavelength of 500 nm) and thermodynamically more stable than anatase phase. However, low temperature anatase phase has attracted much attention recently because of its photocatalytic activity in transforming carbon-oxide gases to hydrocarbon gases.

Generally, the stabilization of rutile phase of TiO<sub>2</sub> films requires a higher substrate temperature (> 300 °C), whereas a lower substrate temperature results in either anatase or an amorphous structure. Recently, it has been shown that both rutile and anatase TiO<sub>2</sub> film can be deposited on unheated substrates by RF magnetron sputtering by changing total pressure of sputtering gases (Ar + O<sub>2</sub>) [1]. In the present work, we have prepared both rutile (R) and anatase (A) TiO<sub>2</sub> films deposited on unheated glass substrates by RF magnetron sputtering. We have also shown that bilayer TiO<sub>2</sub> films consisting of R on A or A on R can be prepared on the same substrate by adjusting the total gas pressure during deposition of the films. The crystal structures of the films were confirmed by x-ray diffraction. Optical transmission and reflection data have been obtained using a UV-Visible (175 nm- 3000 nm) spectrometer. The results of the analysis of these optical data (refractive index/film thickness and optical band gap) will be presented.

[1] K. Okimura and A. Shibata, Jpn. J. Appl. Phys. **36**, 2840 (1997).

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